

**FINAL REPORT**

# **Small Scale Energy Loan Program Interest Rate Buy-Down Pilot Process Evaluation**

**Prepared for:  
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# 1. Introduction

The purpose of this process evaluation of the Small Scale Energy Loan Program Interest Rate Buy-Down, sponsored by the Energy Trust of Oregon (Energy Trust), is to document the program history, accomplishments, and lessons learned. The evaluation considered:

- the program accomplishments,
- the program lessons learned,
- the reasons for participating in the program,
- the reasons for not participating in the program,
- the value of the interest rate buy-down to participants,
- whether there were free riders, and
- whether the Energy Trust should offer an interest rate buy-down as an incentive option in the future.

## ***Program Description***

The Energy Trust partnered with the Oregon Department of Energy (ODOE) to offer the Small Scale Energy Loan Program Interest Rate Buy-Down (Program) from mid-2002 to early 2003. In this Program, the Energy Trust bought down the interest rate for qualified participants in the Small Scale Energy Loan Program (SELP), which ODOE has operated for more than 20 years. Key Program characteristics included:

- *Buy-down incentives.* The Energy Trust offered an interest rate buy-down on SELP loans from 5.75% to 2% for eligible public agencies and nonprofits.
- *Eligibility.* Loan buy-downs were available to public and nonprofit organizations in the Portland General Electric and Pacific Power service areas for energy efficiency measures that reduced electricity use<sup>1</sup>. Eligible organizations included state agencies, universities, community colleges, cities, counties, and nonprofits. K-12 schools were not eligible because they qualified for public purpose funds through a separate allocation under Oregon's restructuring law. The buy-down was only available for projects that did not receive utility rebates.<sup>2</sup>

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<sup>1</sup> Funding for this Program came from a public benefits charge on Portland General Electric and Pacific Power customers. Thus eligible measures had to reduce electricity use and be located in those utility's service areas.

<sup>2</sup> This was intended to avoid providing institutions with larger incentives than they needed to proceed with projects. It was also intended to maximize the number of institutions that have the opportunity to participate in Energy Trust programs.

- *Marketing and administration.* The ODOE marketed and administered the Program.
- *Duration.* Projects had to be contracted in early 2003 and completed by September 2003.<sup>3</sup>

Section 2 provides a more complete description of Program development and history.

## ***Evaluation Approach***

The evaluation team used the following methods to collect information for this report:

- Reviewing program documentation
- Interviewing program staff at the Energy Trust and ODOE
- Interviewing staff from the participating organizations
- Interviewing staff from organizations that were identified by ODOE as potential participants, but who did not participate in the Program

Table 1 summarizes the number of project interviews. In addition to the four program staff, we spoke with all four Program participants. ODOE also provided us with contact information for six non-participants – organizations that ODOE had contacted about the Program but that did not participate. We interviewed all six of these non-participants.

**Table 1 Summary of Completed Interviews**

<b>Type of Person Interviewed</b>	<b>Number</b>
Program Staff	4
Program Participants	4
Program Non-Participants	6

We conducted semi-structured interviews lasting about 45 to 60 minutes for program staff, 30 to 40 minutes for program participants, and 5 to 10 minutes for non-participants. Questions for program staff addressed Program development and delivery, successes, lessons learned, and opportunities for improvement. We asked the participants about their decision to participate in the program and install energy efficiency measures, the installation and performance of the measures, perceived benefits from the project, reasons for participation in the Program, and suggestions

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<sup>3</sup> The initial end date for projects to be contracted was December 31, 2002 and projects had to be completed by mid-2003. This was extended by several months to allow more institutions to participate in the Program.

for Program improvement. Non-participants were asked about their reasons for not participating in the program. We analyzed the notes or transcripts for each interview along with the Program documentation to develop the findings that are presented in this report.

The small number of Program participants allowed us to develop case studies that provide a more complete story of the energy efficiency projects at each of the four institutions (Appendix A). The project case studies are based on the interviews with participants and on project documentation from ODOE.

We present the results of the evaluation in the following sections:

- *Section 2. Program Chronology* – chronicles Program delivery and outreach
- *Section 3. Summary of the Case Studies and Non-Participant Interviews* – provides a brief summary of participating projects and input from non-participants
- *Section 4. Summary and Recommendations* – summarizes the key findings from the Program and makes recommendations for future programs

## 2. Program Chronology

Shortly after its inception in Fall 2001, the Energy Trust was looking for ideas for pilot programs that could quickly generate electricity savings.<sup>4</sup> The ODOE proposed enhancing their existing loan program. The Energy Trust and ODOE considered several options and settled on an interest rate buy-down, which they both believed would be appealing to government agencies because it improved cash flow and made energy efficiency projects more viable. The Energy Trust found this approach attractive because it could be implemented quickly through an established program; it was an effective way to help government organizations; and it would allow them to test the attractiveness of a loan buy-down as an alternative to rebates. Loans offer a complete funding mechanism for a project, while rebates provide direct cash to an organization, but only cover a portion of the cost.

The ODOE has operated SELP for more than 20 years. It began as a way to finance small scale renewable energy projects, but expanded to energy efficiency and conservation in buildings in the mid-1980s. Through the end of 2002, SELP had made 567 loans totaling \$309 million. About 31 percent of the loans have been made to commercial businesses, 35 percent to municipalities, 12 percent to state institutions, 20 percent to residential projects, and 2 percent to non-profits.

In April 2002, the Energy Trust Board approved \$500,000<sup>5</sup> to buy-down the interest rate on SELP loans to eligible organizations. Projected Program savings were 0.9 average megawatts. Table 2 shows a chronology of important Program activities. After Board approval, the Energy Trust and ODOE entered a contract development phase that lasted several months. The Energy Trust found it challenging to incorporate its cost-effectiveness requirements into the contract. As a non-profit, the Energy Trust had requirements they had to meet, but these were different than ODOE's requirements for SELP. In addition, the Energy Trust was a new organization and did not have established contracting forms, procedures, and processes. The State also had contracting requirements that introduced challenges. Finding solutions to the organizations' differences in the contracting process was more arduous and time consuming than the parties had hoped for, taking until June 26, 2002.

While the contract development was taking place, ODOE began to do some promotion to let institutions know that the interest rate buy-down would be available. They used their typical marketing approaches: mailings, advertisements in publications, booths at conferences and trade shows, and direct contact with clients. Interest was slow to materialize, partly because the State of Oregon was going through a significant budget crisis that was affecting governments at all

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<sup>4</sup> The program chronology is based on interviews with Program staff and Program documentation.

<sup>5</sup> There was a check-in after \$300,000 was expended to ensure availability of the remaining \$200,000.

levels. This created uncertainty among the Program’s primary audience and a reluctance to borrow money to pursue capital projects. Budget cuts also tended to reduce facility staff and thus the organizations’ capabilities to consider and pursue energy efficiency projects.

**Table 2 Program Chronology**

<b>Date</b>	<b>Activity</b>
Early 2002	Concept Development
April 2002	Energy Trust Board Approval
April/May 2002	ODOE conducts preliminary marketing announcing the Program
June 2002	Contract signed with ODOE
December 2002	First participant commits to the Program
February 2003	Contract amended to extend end-dates and allow for BETC pass-through
March 2003	Six participants committed to the Program
September 2003	Five projects at four institutions completed
November 2003	Payment made to ODOE and the Program ends

The initial deadline for obtaining loan commitments from participants was December 31, 2002 with completion mandated by mid-2003. Oregon State University was the only institution that had committed by this time, but several others had expressed interest. ODOE asked the Energy Trust for an extension and the contract was amended to extend the Program deadline for commitment and completion by three months.

The contract was also amended to provide a higher discount rate for the Oregon Business Energy Tax Credit (BETC) pass-through. Oregon offers the BETC to businesses that make investments in energy efficiency. Government and non-profit organizations without a tax liability can pass this tax credit to businesses in return for a cash payment to the institution that can be applied to the costs of the energy efficiency project. Participating institutions would be able to use a low interest SELP loan along with the BETC pass-through to fund a project. By providing a higher discount rate to the business partner receiving the tax credit, it was hoped more businesses would be willing to be pass-through partners.

By the March deadline Portland State University (2 projects), the Oregon Institute of Technology, the City of Milwaukee and the City of Stayton had committed to low interest loans. None of the participants except Portland State University took advantage of the BETC pass-through because there was not enough time between the approval of the contract amendment and the commitment deadline to consider this option. Portland State University was able to pass the tax credits for two parts of their projects to a private firm and a private individual.

The project in Stayton was delayed to allow for completion of a water and wastewater master plan. The energy efficiency measures for the remaining projects were installed during the summer of 2003 and all were completed by September. The ODOE invoiced the Energy Trust for the Program costs in October, providing the required program documentation. However, ODOE did not request reimbursement for administrative costs associated with contract negotiation and the extra analysis and reporting that the Energy Trust required. The Energy Trust made the final payment to ODOE in November 2003.

Table 3 outlines the program costs and savings. The Energy Trust spent about \$250,000 on the interest rate buy-downs to obtain 2.2 MWh/year (0.25 aMW) of annual energy savings. Twenty-eight percent of the target Program savings (0.9 aMW) was achieved using half of the original Program budget.

**Table 3 . Program Costs and Savings**

<b>Project</b>	<b>Energy Savings (kWh/yr)</b>	<b>2% Loan Amount (\$)</b>	<b>Energy Trust Buy-down Cost (\$)</b>
OIT - Campus Lighting, Phase 2	902,361	290,526	73,087
OSU – Nash Chiller Loop, Phase 2	415380	251,000	63,141
PSU - Lighting, 5 Facilities	513,600	231,000	58,134
PSU - Student Health, Stott Center	239,240	174,058	43,774
Milwaukie HVAC and Lighting	137,040	44,838	11,753
<b>Total</b>	<b>2,207,621</b>	<b>991,442</b>	<b>249,88</b>



### **3. Summary of Case Studies and Non-Participant Interviews**

In this section of the report we summarize the results from the participant case studies and the interviews with staff from organizations that were identified by ODOE as potential participants, but did not participate in the Program.

#### ***Case Studies***

Four organizations participated in the Program – three universities and one city government. Three are located in northwest Oregon and one is located in southern Oregon on the east side of the mountains. The Program provided low interest loans for five energy efficiency projects. Portland State University conducted two projects. Appendix A contains case studies for the four participating organizations. This section provides a brief summary of the projects.

#### **Project Background:**

All four participants in the Program have a history of making energy efficiency improvements to their facilities, have an ongoing relationship with ODOE, and have relied upon SELP funds to finance efficiency improvements in the past. The efficiency projects funded under the Energy Trust's interest rate buy-down were part of ongoing processes to improve facility energy efficiency and several were the second phase of existing projects. Studies and planning for most of these energy efficiency projects were underway before the interest rate buy-down was available and most of the participants were already planning to borrow money from SELP for their projects. When ODOE informed them about the interest rate buy-down, they took advantage of the opportunity to lower their interest rate.

#### **Description of Measures:**

Two-thirds of the energy savings from Program funded measures were for lighting improvements. Two of the projects were large lighting retrofits, and a small portion of a third project involved lighting. Lighting improvements included installation of T8 tubes and electronic ballasts, T5 HO (high output) lamps, self-illuminated exit signs, and occupancy sensors.

The remaining measures were HVAC and control system improvements. These efficiency measures included the conversion of a dual duct HVAC system to variable air volume (VAV), installation of adjustable speed drives and a more efficient motor on supply and return fans, replacement of roof-top air conditioners with more efficient units, control system upgrades, and a large chiller retrofit combined with development of a chiller loop to improve cooling system performance in adjacent buildings.

In some cases the efficiency measures funded by the Program were part of larger projects that included additional measures such as more efficient furnaces and replacement of an absorption chiller. These measures reduced natural gas energy use, but because they did not also reduce electricity use, they were not eligible for the interest rate buy-down.

### **Installation and Operation:**

Installation of the energy efficiency measures for most of the Program participants took place during the summer of 2003 and was completed by the Program deadline in September. It was challenging for some participants to meet this deadline and, in one case, the project scope was reduced because the installation of some measures could not be completed in time.

The participants reported that installation of the measures went smoothly for the most part. Two participants experienced some delays: one because they had to re-bid their project and another because of concurrent renovation projects. One participant retained their engineering consultant to conduct periodic inspections during installation, and to write a final completion report, which contributed to their success. Another will have their cooling system improvements commissioned this summer.

### **Project Benefits:**

In most cases the measures are performing well, but it is a little early to tell whether they are generating the expected energy savings. The performance of the cooling system improvements will not be evident until the 2004 cooling season.

Besides the energy saving benefits, participants appreciated the improvement in the reliability of their energy systems, reduced maintenance, better control, and improvements in comfort and lighting levels.

### **Program Recommendations:**

All the participants had positive things to say about SELP. They found ODOE supportive and the program easy to participate in. They could not think of ways to improve SELP. Most expect to use SELP in the future and hope that it will continue to be available. Without SELP they would not be able to implement their energy efficiency projects because they do not have the capital budget to pay for these measures themselves. They use the energy savings generated by the measures to pay back the loans.

Taking advantage of the interest rate buy-down was, for the most part, invisible to the participants. ODOE handled the paperwork. Some projects required additional analysis to identify the measures eligible for funding. The key issue for the participants was the short timeframe to take advantage of the buy-down. They

would like the buy-down to be available in the future, but think it is important to have more time to respond. Staff employed by two Program participants found it difficult to take advantage of other Energy Trust Programs, due to a lack of flexibility regarding eligible measures and requirements that were time consuming to meet.

### **Future Plans:**

While one participant said his organization has completed most efficiency improvements for their existing facilities and another noted that his organization had already reduced their electricity use by 25 percent, most participants expect to continue making efficiency improvements in the future. Several noted upcoming new construction projects that will be energy efficient.

### ***Non-Participant Interviews***

ODOE contacted eleven additional institutions as potential Program participants. We interviewed staff from six of these institutions (four cities, two colleges) to learn more about why they did not participate in the Program.

Three of the six non-participants were aware of the interest rate buy-down and had the following reasons for not participating:

- There was not enough time between when they heard of the Program, and when the Program ended, to develop a project, apply for the loan, and gain institutional approval for the project. They are currently doing further analysis and planning for their project.
- The organization does not use loans for small projects and funded the project on their own.
- The organization could not obtain institutional approval for the project, due to a budget crunch and a long payback.

Three of the non-participants we interviewed said they were not aware of the interest rate buy-down. This suggests that, even though these institutions had been contacted about the Program, some were not clear about the incentive options available to them and were not able to seriously consider the interest rate buy-down option. Several of these organizations recently completed projects for which they received incentives from the Energy Trust; these incentives would have made them ineligible for the interest rate buy-down. These projects included:

- Installing a wastewater treatment aeration system using incentives from the Energy Trust and a loan from ODOE.
- Upgrading to LED traffic lights and replacing a well pump using Energy Trust incentives.

The ODOE reported that several other potential participants in the Program chose rebates to help fund their projects, rather than the interest rate buy-down.

The non-participants offered the following suggestions for improving the interest rate buy-down loan option:

- Extend the length of time the program is available. “The deadline came up too soon. There was not enough time to put a plan together. Also, we can’t propose mid year expenses; our budget is laid out at the beginning of the year.”
- Let more people know about the interest rate buy-down. “Publicize the 2% loan more widely. We really would have liked to have known about it.”

Most of the non-participants interviewed liked the idea of a low interest loan. They noted that the lower interest rate makes projects more economically feasible and the loans provide them with the money to do their projects. Although one person preferred to see incentives used for rebates rather than loans, most would like to see low interest loans available in the future: “Keep doing it. Hopefully someday we can take advantage of it.”

## **4. Summary and Recommendations**

In this section we summarize the key findings from the evaluation of the Program and offer recommendations for future Energy Trust public sector programs.

### ***Key Findings***

The key findings are grouped according to the key questions posed in this evaluation.

### **Program Accomplishments**

Five projects were completed at four public institutions, obtaining an estimated 0.25 aMW of electricity savings. The ODOE and Energy Trust were able to work through a number of contractual issues, establish a workable agreement, and implement the Program. ODOE was able to deliver a turn-key program to the Energy Trust that required almost no management time or administrative expense from the Energy Trust. The interest rate buy-down fit well with SELP.

### **Lessons Learned**

The very short timeframe for the Program significantly limited its ability to be effective, except among existing SELP clients, most of whom already had projects in the pipeline. Public institutions often need several years to develop an idea, do the analysis and planning, gain the appropriate approvals, and obtain funding. Few organizations were able to take advantage of the Program because it lasted less than a year. In addition, findings suggest that more time was needed to alert institutions to the interest rate buy-down option, to allow them to become familiar with it, and to differentiate it from other options.

The ODOE and Energy Trust also learned that their different organizational needs and requirements create challenges for working together. The Energy Trust requirements for the interest rate buy-down were more rigorous and less flexible than those used by ODOE for SELP. While these differences were able to be worked out contractually, it did lead to some frustration for ODOE by making it harder to deliver the Program and attract participants. In addition, ODOE staff felt they were competing with other Energy Trust rebate programs, although they did not specify which programs. This perception added to their frustration. The very short timeframe of the Program makes it difficult to assess how much Energy Trust requirements and competing programs limited Program success, but it is clear that the few Program participants appreciated the flexibility of SELP.

### **Reasons for Participation**

The Program participants did not have capital available to make energy efficiency investments and SELP was the only means of funding their projects. When they

became aware of the interest rate buy-down, they took advantage of the opportunity to obtain lower interest financing.

The non-participating institutions that we spoke with were either not able to meet the Program deadlines, decided not to use a loan, or were not aware of the interest rate buy-down. Two organizations that indicated they were not aware of the interest rate buy-down used rebates to help fund their projects, which made them ineligible for the buy-down. The ODOE also reported that several other institutions they contacted about the Program chose rebates instead of the interest rate buy-down.

### **Value of the Interest Rate Buy-down**

The interest rate buy-down improved the feasibility of the participants' projects. The participating institutions looked for the energy savings from the measures to pay back the costs of their loans. Lower financing costs allowed more energy efficiency measures to be included in the projects for some participants. The participants liked using loans to fund their efficiency projects and the interest rate buy-down fit invisibly into SELP.

### **Extent of Free Ridership**

The very short timeframe for this Program meant that only organizations that had already planned their projects could participate. In a few cases the deadline for the buy-down speeded up project implementation, and a few participants said they would have scaled back their projects without the buy-down. In other cases, the projects were already defined and the lower interest rate did not influence the measures that were installed. Overall, then, the interest rate buy-down had little influence on the majority of energy efficiency measures that participants installed.

### **Interest Rate Buy-down as an Incentive Option**

The short duration of the Program did not allow for the interest rate buy-down incentive option to be tested in comparison to other incentives. There was no evidence from the interviewed participants or non-participants that they had compared the option of taking a rebate versus taking the interest rate buy-down and selected one over the other<sup>6</sup>. We found that all the institutions were unclear about what incentive options were available to them. While Program staff and a few institutions suggested that rebates are preferred, two of the Program participants indicated they preferred the interest rate buy-down and did not want to hassle with the additional requirements of rebates<sup>7</sup>. For those institutions preferring loans, the interest rate buy-down was a simple way to receive an incentive because it fit invisibly into SELP and did not require dealing with an additional funding source.

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<sup>6</sup> Some non-participants we did not talk to may have made this comparison and selected the rebates.

<sup>7</sup> The third participant we spoke with did not have a preference.

## ***Conclusions and Recommendations***

The Program was initiated in a very short period of time as a pilot in the early days of the Energy Trust. There was little time to work out the Program details and introduce the Program to the target audience in a strategic manner. As a result, few institutions had the opportunity to consider the Program. The four that did participate generally had well-defined projects that were minimally influenced by the interest rate buy-down. However, the participants liked the Program and the ODOE was able to seamlessly deliver the interest rate buy-down as part of SELP with almost no management time or expense from the Energy Trust.

Findings suggest there are opportunities for the Energy Trust to build on this experience and that public sector clients are willing to pursue efficiency improvements. The experiences of the Program participants and non-participants, as well as the program sponsors, suggest that future Energy Trust public sector programs can be improved so that more institutions can participate. With this in mind, we make the following recommendations.

- **Offer programs for longer periods.** Long lead times for capital improvement projects require energy efficiency programs to be available for several years in order to influence public institutions to take action and to provide them with the opportunity to participate. Programs need to be publicized over a period of time so that institutions have numerous opportunities to become aware of and familiar with what is being offered.
- **Integrate and coordinate program offerings.** Institutions were unclear and confused by what incentives were available to them. Different Energy Trust programs were competing for the same public sector clients along with programs offered by ODOE. This is not very efficient, creates confusion, and can make it harder for institutions to consider the options available to them. Public sector program offerings should be presented in an integrated and coordinated fashion.
- **Offer flexible and simple programs.** Participants in SELP complimented its flexibility and simplicity. Because the interest rate buy-down was packaged with SELP, it made some of the added requirements from the Energy Trust invisible to the participants. But these requirements could have excluded some from the Program and added complexity that could have discouraged others from participating. For example, efficiency measures that saved only natural gas or that did not meet certain cost-effectiveness criteria were not eligible for the interest rate buy-down. While less rigid criteria could increase the cost of future programs, they might also leverage additional savings opportunities that increase overall program effectiveness.

- **Use and develop relationships.** Participants in SELP have often used the program more than once and have developed working relationships with ODOE staff. These relationships build credibility and make it easier for institutions to implement energy efficiency projects. When developing public sector programs, the Energy Trust needs to consider how it can directly develop relationships with these institutions or, if the program is delivered through a third party, such as ODOE, how it can best leverage existing relationships.



## Appendix A. Participant Case Studies

### ***Oregon Institute of Technology***

**Institution Name:** Oregon Institute of Technology

**Location:** Klamath Falls, Oregon

**Contact:** David Ebsen, Interim Director of Facilities

**Project Title:** Phase 2: Campus Lighting Upgrade

#### **Introduction:**

The Oregon Institute of Technology (OIT) began operation in 1947. Today OIT offers traditional four-year bachelor's degree programs in the engineering and health technologies, applied sciences, and management and communication studies at its main campus in Klamath Falls, Oregon.

#### **Project Background:**

OIT was contacted in 1999/2000 by Pacific Power about opportunities to improve energy efficiency on campus. At the time, the Governor of Oregon had issued a mandate for public institutions to reduce their energy consumption by ten percent, which was an added impetus to OIT to pursue efficiency improvements. Pacific Power funded a study of energy efficiency options by Systems West Engineers (SWE) through their FinAnswer Program. Based on the results of this study, OIT selected the measures with the best paybacks and used a loan through the Oregon Department of Energy's (ODOE) Small Scale Energy Loan Program (SELP) to fund the phase 1 lighting efficiency improvements.

After completion of phase 1, OIT hired SWE, which is on retainer through the Oregon University System, to conduct a phase 2 study and propose additional energy efficiency improvements. SWE evaluated lighting systems in eight major and multiple smaller structures on the OIT campus. In a report completed in November 2002, they recommended fixture upgrades, lamp and ballast replacements, and simple lighting controls. OIT selected the energy efficiency measures to pursue based on the ability of energy savings to meet or exceed the cost of financing the measures. Since OIT did not have the budget to fund these capital improvements on their own, they planned to borrow money through SELP. They learned about the availability of the interest rate buy-down from the ODOE and decided to pursue that option for this project.

**Description of Measures:**

The lighting system efficiency improvements included T8 lamps, electronic ballasts, compact fluorescent lamps, T5 HO lamps, self-illuminated exit signs and occupancy sensors. These measures were installed in over 470,000 square feet of space, in eight campus buildings, including classrooms and offices, the library, residence hall, athletic facility, physical plant and student union, plus several miscellaneous buildings (storage, pump house, tunnel system).

The total energy savings for this project were estimated to be 902,361 kWh/yr with a payback of a little over 9 years (Table A). The fixture improvements accounted for approximately 84 percent of the energy savings and reduced the overall lighting power density (watts/square foot) by more than 35 percent. The remaining 16 percent of savings were from the occupancy sensors

Table A. Project Costs and Savings

	Loan Amount	Electricity Savings	Cost Savings	Payback
	\$	kWh/yr	\$/yr	yr
Total:	290,526	902,361	31,600	9.2

OIT also installed variable frequency drives on some air handling units and connected them to their digital control system. These measures were not part of the project funded through the Energy Trust interest rate buy-down.

**Installation and Operation:**

Through a competitive bidding process L.H. Morris & Company was selected for both phase 1 and phase 2 of the OIT lighting upgrades. The company began installing the energy efficiency improvements for phase 2 in June 2003 and the project was completed in September. Installation was coordinated with scheduled activities on campus to provide as little disruption as possible. OIT’s Director of Facilities indicated that the installation went smoothly: *“We have had a very good working relationship with these folks [contractor] through both of these phases and, of course, Systems West Engineers is here to make sure that work is done according to the guidelines that are set forth. They came out periodically. I built that into their contract that they would come and provide X amount of site visits, substantial completion report, and a final completion report.”*

**Project Benefits:**

So far the phase 2 energy efficiency improvements are working as expected, but it is too soon to tell whether they will produce the estimated energy savings. OIT has found that the phase 1 energy efficiency improvements are meeting the projected

savings levels. Annual electricity use declined about 25 percent (2,441,192 kWh/yr) from 2000 to 2003.

Feedback from occupants about the lighting improvements has been mostly positive. Even with lower energy use, lighting levels seem to have improved. There has been some negative feedback about the occupancy sensors *“when people are in their offices and they are sitting at their keyboards typing away and all of a sudden the lights will go off.”*

Key benefits include reduced energy consumption and improvements in the building environment from improved lighting levels. The improvements also contribute to OIT’s sustainability program. In the near term there are maintenance benefits because all the fixtures are new and it will be a while before staff needs to replace tubes or ballasts. In some cases the new lights have a longer life than those that were replaced.

To most of the campus community, the energy efficiency improvements are intangible. Budgets are not reduced because the energy savings is being used to pay back the loan. OIT will not start reaping the benefits from the energy savings until the loans are paid. But they have been able to make an investment in their facilities and reduce energy use, which is consistent with their goals.

**Program Recommendations:**

Without the budget to fund energy efficiency improvements, programs like SELP are the only way that OIT can implement energy efficiency projects. The Energy Trust’s interest rate buy-down reduced the financing costs and allowed OIT to expand their project and still meet their requirement that energy savings cover the loan payments. OIT found the staff at the ODOE *“terrific to work with”* and very responsive. They found it easy to participate in SELP. The process of obtaining the interest rate buy-down was handled by the ODOE and was invisible to OIT. When asked how the program could be improved, OIT’s Director of Facilities responded, *“I can’t imagine how – I really can’t. It went so darn well, I can’t think of a negative at all.”*

**Future Plans:**

OIT would like to conduct phase 3 of their campus energy efficiency improvements in 2004 or 2005. They will consider any measures they missed in the first two phases and sub-meter their buildings so they can better track and manage their energy use. OIT is planning to construct a new residence hall in 2006 and they will seek LEED (Leadership in Energy and Environmental Design) silver certification.

## **City of Milwaukie**

**Institution Name:** City of Milwaukie

**Location:** Milwaukie, Oregon

**Contact:** Kelly Somers, Fleet and Facilities Manager

**Project Title:** HVAC and Lighting Upgrades at Library, Public Safety, and Public Works

### **Introduction:**

The City of Milwaukie is located in the Northern part of Clackamas County just southeast of Portland. The City grew about 10 percent between 1990 and 2000, and the population reported in the 2000 Census was 20,490.

### **Project Background:**

In 1990 the Facilities Manager for the City of Milwaukie initiated a process to improve the energy efficiency of City facilities. They began with a lighting project that changed many of their fixtures to T8 lamps and electronic ballasts. They received a rebate for these lighting improvements from their utility and ODOE provided a loan to complete this project. When they built a new City building in 1992, they incorporated energy efficient lighting and glazing into the building and received a rebate from the power company. This was followed by heating and cooling upgrades at City Hall, which also involved ODOE, and installation of a more efficient boiler in the Library.

Several years ago, the City hired a consultant to look at their buildings and recommend any remaining energy efficiency improvements. They followed those recommendations *“that had a good payback”* and worked with the ODOE to fund the project. These recent improvements, according to the Facility Manager, will finish the process of upgrading the energy efficiency of their buildings, *“We are just about finished – we probably have another month and we will have everything done. Then all of our buildings will be not only energy efficient, but easy to control.”*

### **Description of Measures:**

The recent energy efficiency improvements include HVAC upgrades in four City buildings covering more the 60,000 square feet of space - the Library, City Hall, Public Safety, and Public Works. A small lighting upgrade was made in the Public Works Building. The Energy Trust of Oregon (Energy Trust) interest rate buy-down was available only for the measures in the project that saved electricity. Four measures were funded:

- EEM 1: Library Multi-Zone Air Handler Fan Motor Upgrade. A circa 1960 motor rated at 75% efficiency was replaced with a 91.7% efficient motor on the main library air handling unit.
- EEM 2: Library Roof-Top Air Conditioner Upgrade. The energy efficiency of the cooling section was increased for two rooftop units slated for replacement on the library addition.
- EEM 3: Public Safety Building AC-1 & AC-2 Adjustable Speed Drive Upgrade. Adjustable speed drives were installed on the supply and return fans.
- EEM 4: Public Works Fixture Replacement. Metal halide fixtures were replaced with T5 HO (High Output) fluorescent fixtures.

These efficiency measures are expected to reduce the City’s annual electricity bill by \$9,000 and produce an overall payback of about 5 years (Table B). The majority of the electricity savings is from the adjustable speed drives in the Public Safety Building.

Table B. Estimated Project Costs and Savings

	Loan Amount <sup>1</sup>	Electricity Savings	Cost Savings	Payback
	\$	kWh/yr	\$/yr	yr
EEM1	1,386	5,240	350	4.0
EEM2	3,739	3,570	240	15.6
EEM3	24,584	101,290	6,790	3.6
EEM4	10,200	26,940	1,800	5.7
10% contingency	3,990			
Total:	43,899	137,040	9,180	4.8

1. The actual loan amount was \$44,838, reflecting slightly higher actual costs for the measures.

The City also implemented several energy efficiency measures that reduce natural gas use. These included replacing the furnace in the shop area with radiant heating units, adding insulation and installing more efficient furnaces in the office area of the Public Works Building, and improvements to control systems.

**Installation and Operation:**

Installation of the energy efficiency measures got started in July 2003. The four measures funded by the low interest loan were completed in September 2003. In January 2004, the last of the control system improvements were being completed. The work was done by Milwaukie Heating Company, Northwest Controls, and Dryer Electric. The Facility Manager was pleased with the job they did, “We

*actually laid out a schedule and worked with the contractors and they did a good job.”*

**Project Benefits:**

The improvements in the library and Public Safety Building are done and are working well. The Facility Manager indicated he has received positive comments from people in the Library: *“The library folks have commented. They think the building is warmer and it cools better. That’s one of the problems we have always had with the library is trying to keep people cool. They have commented that it is working very well.”* The improvements in the Public Works Building are not quite done.

The Facility Manager sees two primary benefits from the project: *“Number 1, we are getting better heating and cooling, which is real important, better control over the building.”* This makes it easier for his staff to respond to complaints and to correct problems. *“The other thing I think we are getting is better air quality.”* This is due to better equipment and air circulation. *“That’s probably the most important thing we have done is to keep people comfortable.”*

**Program Recommendations:**

The Facility Manager for the City of Milwaukie likes SELP because it is available, easy to use, and because of the relationship they have with the ODOE: *“Well, it’s available, it’s easy – it’s not a difficult process to go through. We get a lot of support from the state and we’ve got a real good rapport with them, we know them personally because we’ve been working with them for so long. We have a good relationship and that makes it nice.”* He did not have any recommendations for improving the loan program. He would just like to see it continue.

The City learned about the interest rate buy-down from the ODOE, who dealt with the paperwork. The only challenge noted by the Facility Manager was the very short timeline to complete the project: *“We had to quickly pull some contractors together and we got done right under the wire. We had to really move. That would be one thing – I hope the next time they do that, I hope they can give us a little more time.”* He hoped this option is available in the future because it allows them to do more.

**Future Plans:**

When asked if the City had plans for any future energy efficiency projects, the Facility Manager replied, *“We are getting pretty close to being done.”* They are planning a building addition and will incorporate energy efficiency into the design. Over the last 14 years, the City has significantly improved the performance and comfort of their facilities.

## **Oregon State University**

**Institution Name:** Oregon State University

**Location:** Corvallis, Oregon

**Contact:** Mike Blair, University Civil Engineer

**Project Title:** Nash Chiller Loop, Phase 2

### **Introduction:**

Oregon State University (OSU), located in Corvallis in the heart of the Willamette Valley, was established as Oregon's land grant university in 1868. It currently has nearly 19,000 students and is recognized for its engineering, environmental sciences, forestry, and pharmacy programs.

### **Project Background:**

In 2000, Oregon State began looking at options to replace the chiller in Nash Hall and upgrade the cooling systems in five adjacent buildings. All of these buildings accommodate critical research projects and more reliable cooling systems were needed. As the University Civil Engineer noted, *"Without reliable cooling systems in place for these buildings, the research could be compromised or destroyed, and we are talking about millions of dollars in insurance."*

Systems West Engineers was hired in 2000 to conduct a preliminary study. They followed this with a more detailed analysis that OSU used in their decision to replace the existing absorption chiller in Nash Hall with a larger, more energy efficient centrifugal chiller that could also provide cooling to adjacent buildings. OSU applied to SELP for a \$1.74 million loan to complete this project, and the loan was approved in March 2002.

In late 2002, OSU learned from the ODOE that the Energy Trust was offering an interest rate buy-down on SELP loans. They worked with ODOE and their consultant to apply for these low interest funds to cover a portion of their project cost. They were eligible to borrow \$251,000 at the lower interest rate.

### **Description of Measures:**

The Nash Chiller Loop project consisted of two phases: installation of the chiller at Nash Hall and creation of the multi-building cooling distribution loop. In phase 1, a 600 ton energy efficient centrifugal chiller was installed in Nash Hall. This chiller is larger than the 377 ton building load and allows the chiller to provide cooling capacity to adjacent buildings, thus reducing the operation of less efficient chillers in these buildings. The Nash chiller will become the lead chiller among the four chillers expected to operate.

Phase 2 involved connecting the cooling systems of all of the buildings with appropriate controls for optimum chiller selection and water flow. This included valve modifications to allow for variable flow pumping, adjustable speed drives for variable flow pumping, and enhanced controls.

Of the total \$1.74 million dollar project loan through SELP, \$251,000 was eligible for the low interest rate buy-down from the Energy Trust. Eligible costs included the 1) improved chiller in Nash Hall; 2) valve modifications to allow for variable flow pumping; 3) adjustable speed drives for variable flow pumping; and 4) enhanced controls. The remaining project investment resulted in natural gas energy savings or produced benefits with only ancillary electricity savings that were not eligible for Energy Trust funds. The estimated electricity savings from the portion of the project eligible for the low interest loan are 415,380 kWh/yr, saving \$24,920 per year in electricity costs and providing a 10 year payback (Table C).

Table C. Project Costs and Savings

	Loan Amount	Electricity Savings	Cost Savings	Payback
	\$	kWh/yr	\$/yr	yr
Total:	251,000	415,380	24,920	10.1

**Installation and Operation:**

Hydro Temp Mechanical installed phase 1 of the Nash Chiller project. Most of the work on phase 2 was conducted during the summer of 2003 by Collins Mechanical. The University will have the system commissioned in the summer of 2004 when they will be able to fully test the cooling operation. The installation generally went smoothly, but any project of this complexity – *“it’s fairly complex to try to connect all these different buildings together with a cooling system and [deal with] existing conditions that are unknown”* – will have a few glitches. There were *“some change orders required but no more than what you would think would be normal.”*

The University also had to re-bid the phase 2 work because the initial bids came in higher than expected. That set the project back several months. They repackaged the request for proposals, providing some new options, and were able to obtain an acceptable bid and move forward. By the time the project was completed, however, the cooling season was over and they were not able to fully test and commission the system.

**Project Benefits:**

The University expects the new cooling system to be more reliable. There is more cooling capacity, so it should be easier to maintain building temperatures during hot summer weather. The system will also be more efficient, saving electricity and



reducing energy costs. In the 2004 summer season, they will be able to see if the system meets their performance expectations.

**Program Recommendations:**

According to the University Civil Engineer SELP *“worked real well. The Office of Energy is very helpful and I think it’s a good program. For this particular project it really met our needs, enabled us to do the project.”* The University finds this program easy to use and they will continue to use it in the future. They had no suggestions for improvements to SELP.

The University appreciated the interest rate buy-down because it reduces the amount of money they have to pay back on the loan, thus saving them money. The only issue they had with the buy-down was timing: *“By the time we found out about it, we only had about a month or so to do it.”* They also would like to see more flexibility in the requirements of other Energy Trust programs that make it easier for them to qualify for support.

**Portland State University**

**Institution Name:** Portland State University

**Location:** Portland, OR

**Contact:** Ron Ritchie, Assistant Director Maintenance and Systems

**Project Title:** Lighting Retrofit in Seven Campus Facilities & Student Health Services Renovation/Peter Stott Controls Upgrade

**Introduction:**

Portland State University (PSU) is a public university established in 1946 and located on the southern edge of Portland’s urban core. The university currently offers over 100 undergraduate, masters, and doctoral degrees, as well as graduate certificates and continuing education programs. PSU serves more students and confers more graduate degrees annually than any Oregon University.

**Project Background:**

PSU implemented two energy efficiency projects through the Small Scale Energy Loan Program (SELP) Interest Rate Buy-down. One project involved lighting upgrades in five campus buildings and the other made HVAC and control system improvements in the Health Center and Stott Center Buildings.

PSU has taken advantage of assistance in the past from Portland General Electric to upgrade the majority of their lighting to T-8 lamps and electronic ballasts. They

wanted to complete the lighting upgrades on campus along with lighting improvements at their tennis courts and gym. The SELP Interest Rate Buy-down provided an opportunity to obtain funding to do this and Portland General Electric provided assistance analyzing the project.

The Health Center HVAC project was part of a major renovation to create a consolidated student health center in the University Center. This improvement was identified in the state design review process for the renovation. The controls project in Stott Center replaced failing pneumatic controllers with digital controllers offering improved control capabilities.

PSU has used SELP in the past to fund energy efficiency improvements at the university and was aware of this program. They learned about the interest rate buy-down from the Oregon Department of Energy (ODOE). The interest rate buy-down allowed them to implement some improvements that they otherwise would not have done and the limited availability of the funding caused them to move forward more quickly with the projects.

**Description of Measures:**

Lighting systems in five campus buildings were upgraded as part of the lighting retrofit, resulting in more than a 40 percent reduction in lighting electricity demand in those buildings. The estimated energy savings from this retrofit were 513,600 kWh/yr or \$33,690, providing a payback of a little less than seven years (Table D).

Table D. Project Costs and Savings

	Loan Amount	Electricity Savings	Natural Gas Savings	Cost Savings	Payback
	\$	kWh/yr	therms/yr	\$/yr	yr
Lighting Upgrade	231,000	513,600	-	33,690	6.9
HVAC/Controls	174,058	239,240	32,820	42,260	4.1
Total:	405,058	752,840	32,820	75,950	5.3

The second project at PSU involved the conversion of a dual duct HVAC system to variable air volume in the Student Health Center and control system upgrade at Stott Center. The HVAC system conversion reduces fan, heating, and cooling energy use. Because the Health Center project is a substantial remodel of about 18,800 square feet it went through State Energy Efficiency Design review. Energy efficiency gains for T5 lighting systems as well as high performance glazing and insulation upgrades are not included in the SELP funded project because PSU must meet state requirements to do 20 percent better than the energy code. The control system upgrade for Stott Center replace the existing pneumatic controllers for the heating coils with digital controllers that include three control system improvements: time of day scheduling; night setback and shutdown; and optimum

start and stop. These measures generate both natural gas and electricity energy savings totaling \$42,260 per year. Savings from the controls upgrade accounts for about two-thirds of the project cost savings.

**Installation and Operation:**

The installation of the two efficiency projects was completed in September 2003. The lighting retrofit originally involved seven facilities. PSU delayed lighting retrofits in Cramer and Lincoln Halls because near term renovations would require removal of the new fixtures. This reduced their loan amount by more than \$50,000 and the annual savings by \$5,000. Christiansen Electric installed the lighting improvements, Interstate Mechanical did the HVAC conversion, and Siemens did the control system upgrade in Stott Center.

The efficiency improvements are performing well. They had to reset the parameters on the controllers in Stott Center to get them to work properly in cooling mode and now they are working fine.

**Project Benefits:**

Students and staff have responded positively to the improved lighting quality from the lighting upgrades. The control improvements in Stott Center provide much better temperature control, eliminating occupant complaints. Facility staff are able to be much more responsive. The center is used for recreation activities and they usually keep temperatures around 66 degrees. Now they are able to raise the temperature in an activity room for a yoga class that requires a higher temperature to be comfortable.

PSU is confident the energy efficiency projects are producing energy savings, but they do not have data to show any energy reduction.

**Program Recommendations:**

PSU spoke favorably about SELP and ODOE staff, who they found very helpful and easy to work with. They have taken advantage of SELP and Portland General Electric rebates in the past and would like to be able to take advantage of loans and rebates in the future. The interest rate buy-down was valuable to them and they would like to see it offered again.

PSU has also taken advantage of the Business Energy Tax Credit (BETC) offered in Oregon. Using the BETC Pass-Through option, they can sell the tax credits earned by their energy efficiency projects to businesses and individuals that can use them on their state tax returns. For this project they were able to sell the tax credits for the Stott Center controls project and lighting upgrades. However, PSU noted that the BETC Pass-Through is something they have trouble taking advantage of because it is difficult to find people to purchase the tax credits.

**Future Plans:**

PSU is doing small-scale projects such as installing occupancy sensors. They are redoing the park block lighting. Given the age and number of buildings on campus, there are opportunities to make further efficiency improvements.